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The eleotrid fishes of Lake Kutubu, Papua New Guinea with descriptions of four new species

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Abstract

The eleotrid fishes of Lake Kutubu in the Southern Highlands district of Papua New Guinea are reviewed. Six species, including *Mogurnda variegata* Nichols, *Oxyeleotris fimbriata* (Weber), and four new species of *Mogurnda* described herein, were collected by the senior author during a visit to the lake in 1983. *Mogurnda kutubuensis* sp. nov. is related to a close knit complex of species restricted to New Guinea and northern Australia. It differs from the members of this group by a combination of features which include coloration and counts for fin rays and scales. The three remaining new species, *M. furva*, *M. spilota*, and *M. vitta* are allied to *M. variegata*. They differ from each other primarily with regards to their distinctive colour patterns and from other species of *Mogurnda* by having a more elongate snout which except for *M. vitta* has a distinctive concave profile. All species except *Oxyeleotris fimbriata* are apparently endemic to Lake Kutubu. Diagnoses, descriptions and illustrations are provided for both new taxa and previously described species.

Introduction

The family Eleotridae, commonly known as gudgeons or sleepers is represented by about 120 species belonging to approximately 30 genera. They typically dwell in brackish or freshwater environments, primarily in tropical and subtropical regions. Most marine species, formerly assigned to this family are now included in Gobiidae. The largest number of species inhabit the Indo-Pacific region. Because of extensive speciation in fresh waters of Australia and New Guinea, about 70 species or nearly 60 per cent of all eleotrids are found there.

The present paper is the second in a series dealing with the exclusively freshwater eleotrids of Australia-New Guinea. The genus *Hypseleotris* Gill of Western Australia was treated in the first paper (Hoese and Allen 1983). We now deal with the eleotrid fauna of Lake Kutubu situated in the Southern Highlands district of Papua New Guinea (Figure 1). Nichols (1951) described an eleotrid, *Mogurnda variegata*, which was collected at this locality (although mis-spelt Lake Katuba

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by Nichols) in 1936 by the Archibold Expedition from the American Museum of Natural History. Munro (1964) reported 15 additional specimens procured at the lake by a government patrol officer in 1955. He remarked on the unusual variability in colour pattern and body shape exhibited by this series and provided drawings of five specimens. He also mentioned that the native population at Lake Kutubu had at least eight names for the various colour phases.

The senior author had an opportunity to visit Lake Kutubu during September 1983. Two rotenone collections and seining activities yielded a number of diverse eleotrids, which largely agreed with the varieties of *M. variegata* illustrated by Munro. Subsequent examination of this material revealed that five species were represented including *M. variegata* and four new taxa which are described herein. In addition, a sixth eleotrid, *Oxyeleotris fimbriata* was collected at the lake and is reported on here.

Lake Kutubu (Figure 1), one of the largest lakes in New Guinea, is situated approximately 370 kilometres north-west of Port Moresby or 40 kilometres south-west of Mendi, the nearest large population centre. It is about 19 kilometres in length and 2-3 kilometres in width, being situated in a limestone basin surrounded by high mountains. According to Bayly *et al.* (1970) the lake was formed by volcanic damming of the basin during the Pleistocene between 10,000-500,000 years ago. The maximum and mean depths are about 70 and 36 metres respectively. Mean annual rainfall at Lake Kutubu is 450 cm. The lake is drained by the Soro River which joins the Hegigio River, a tributary of the Kikori River system, which ultimately flows into the Gulf of Papua. The lake lies at an elevation of 800 metres above sea level and can be reached only on foot or by chartered aircraft. There are about 15 small villages in the area and all inhabitants speak the Foe (pronounced 'foy') language.

The fish fauna of Lake Kutubu as presently known consists of 12 species including the six eleotrids, a plotosid *(Oloplotosus torobo* Allen), an atherinid (*Craterocephalus lacustris* Trewavas), a melanotaeniid (*Melanotaenia lacustris* Munro), a teraponid *(Hephaestus adamsoni* Trewavas), and a gobiid *(Glossogobius* sp.). All except *Oxyeleotris fimbriata* and the introduced mosquitofish, *Gambusia affinis*, appear to be endemic.

The data for our collections from Lake Kutubu are as follows: Station 1 — Soro River, about 30 metres in width, near north-west end of lake, at end of walking track from Moro landing strip (approximately 6°23′S, 143°14′E), rotenone and seine, G. Allen, J. Paska, and B. Crockford, 26 September 1983; depth 0-3 m, water clear, soft mud bottom with abundant vegetation, water temperature 26.0°C, pH 8.3. Station 2 — west shore of lake opposite Wesame Island at mouth of small tributary stream (approximately 6°24′S, 143°18′E), rotenone and seine, G. Allen, J. Paska, and B. Crockford, 27 September 1983; depth 0-2 m, water clear, soft mud bottom with abundant vegetation, water temperature 23.8°C, pH 7.8.

All CSIRO specimens included in this paper were collected at Lake Kutubu by C.E.T. Terrell in March 1955.

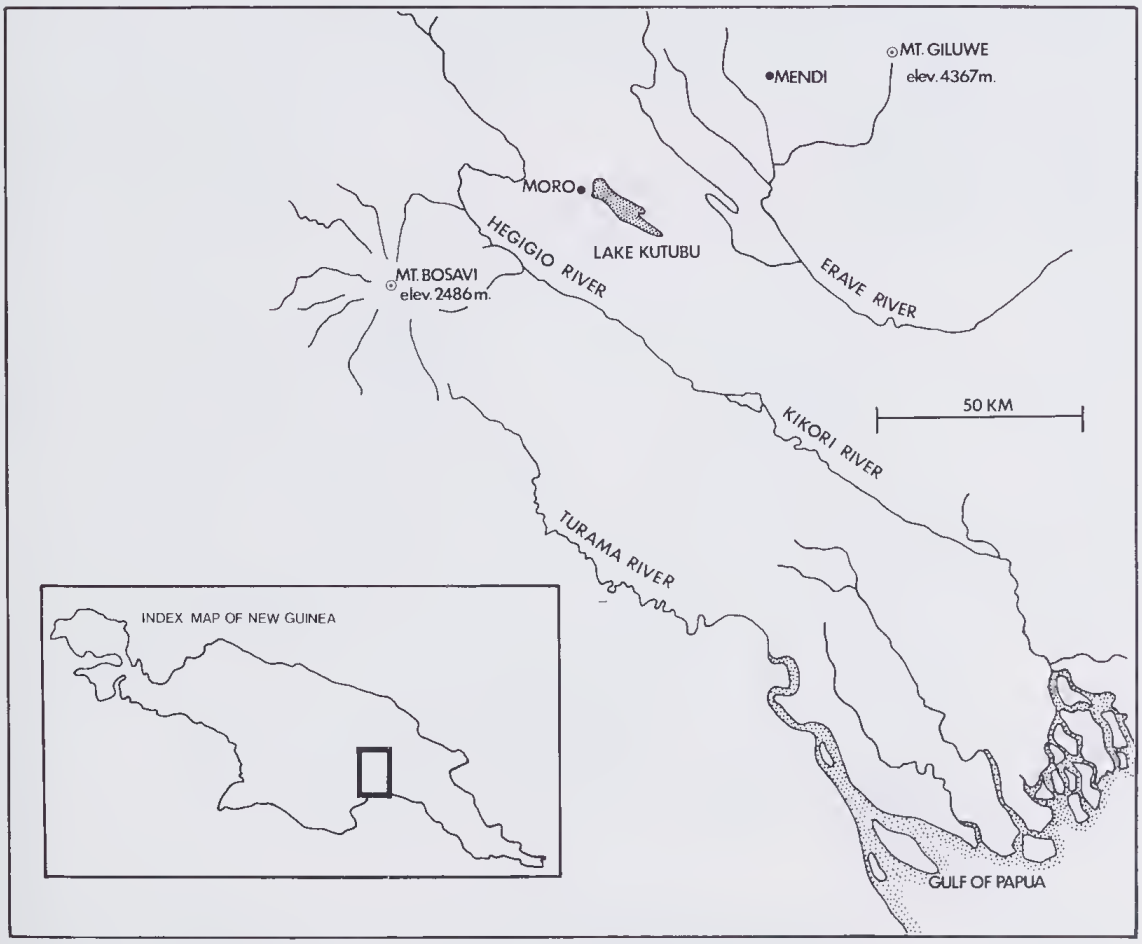

Figure 1 Map of Lake Kutubu region of southern Papua New Guinea.

Methods

Methods for counts and measurements mainly follow those of Hubbs and Lagler (1958). The longitudinal scale count or scales in lateral series was taken from the upper pectoral base obliquely to the midline and then horizontally to the end of the hypural. The transverse scale row count was taken from the origin of the second dorsal fin downward and backward to the anal base. The post-dorsal count is taken from the end of the second dorsal fin to the caudal base mid-dorsally. Gill raker counts include all rudiments. The last ray of the anal and second dorsal fins is split at the base and is counted as a single element.

Sex was determined by examination of the genital papilla (Figure 2). Colour when fresh was taken from Ektachrome transparencies of dead specimens photographed within 15-30 minutes of capture. The abbreviation SL refers to standard length. Counts and measurements that appear in parentheses refer to the range for paratypes if differing from the holotype. Institutional abbreviations are as follows: AMNH – American Museum of Natural History, New York; AMS – Australian Museum, Sydney; CSIRO – Commonwealth Scientific and Industrial Research Organisation, Division of Fisheries and Oceanography, Hobart, Australia; PNG – Kanudi Fisheries Research Laboratory, Port Moresby, New Guinea; WAM – Western Australian Museum, Perth.

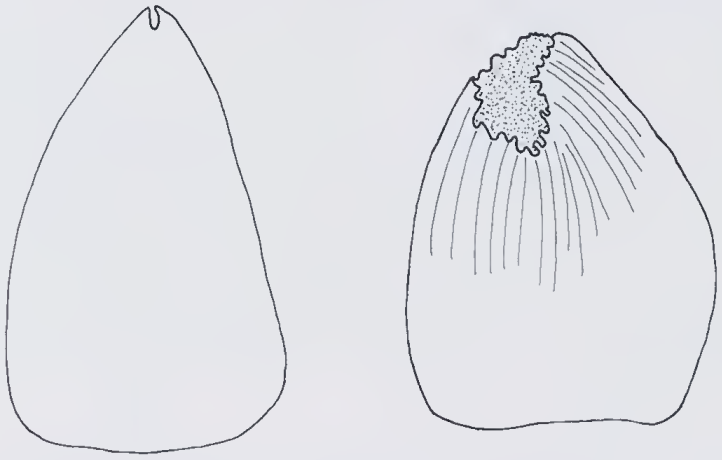

Figure 2 Camera lucida drawing of genital papilla of *Mogurnda kutubuensis:* (A) male, and (B) female. Height of papillae about 3.0 mm.

Systematics

Key to the eleotrid fishes of Lake Kutubu

1a Scales in lateral series 55-60; predorsal scales 28-40; soft anal rays 8-10; colour dark brown, often with series of darker chevron-shaped markings along side and black spot at base of upper caudal fin rays . . . . . *Oxyeleotris fimbriata*

1b Scales in lateral series 36-43; predorsal scales 11-27; soft anal rays 10-13; colour not as in 1a 2

2a Snout relatively short and blunt (Figure 7), its length 7.8-9.8 in head length, but usually less than 9.2 . . . *Mogurnda kutubuensis* sp. nov.

2b Snout relatively elongate and pointed (Figures 4, 9, 11 and 13). Its length 9.1-11.3 in head length 3

3a Pectoral rays 14; scales in lateral series 42-43; a broad, white stripe (series of white blotches in young) along middle of side ..... *Mogurnda vitta* sp. nov.

3b Pectoral rays 15-16; scales in lateral series 36-40; white stripe along middle of side absent 4

4a Colour of body and fins black without distinguishing marks ..... *Mogurnda furva* sp. nov.

4b Colour of body and fins not uniformly black, consisting of well contrasted light and dark blotches 5

5a Transverse scale rows 12-13; head dark with white bands radiating from rear portion of eye; body greenish-brown with large white blotches on side ..... *Mogurnda spilota* sp. nov.

5b Transverse scale rows 14-15; head tan or light brown with darker bands radiating from rear portion of eye and dark mottling on dorsal surface; body mottled with large dark brown spots ..... *Mogurnda variegata*

Mogurnda furva sp. nov.

Figures 3 and 4

Holotype

WAM P28158-009, female, 65.2 mm SL, Lake Kutubu, Papua New Guinea – Station 1.

Paratypes

WAM P28158-011, 2 specimens, 19.0-31.0 mm SL, collected with holotype.

Diagnosis

A species of *Mogurnda* Gill differing from most members of the genus by an elongate, pointed snout and a blackish colour. It is most closely allied to *M. spilota, M. variegata,* and *M. vitta,* all of Lake Kutubu, which have a similar snout shape, but differs from them in lacking distinguishing marks (blotches, spots, or stripes), on the head, body, and fins. It further differs from *M. vitta* in being deeper bodies (depth at pelvic fin origin 23-24 per cent of SL v. 19.3-21.3 per cent), in having 15 or 16 rather than 14 pectoral rays, 39 scales in mid-lateral series compared with 42-43, and having a concave rather than straight snout profile. It also has a lower transverse scale count than *M. variegata* (12 or 13 v. 14 or 15).

Description

Dorsal rays IX-I, 11 (VIII or IX-I, 11 or 12); anal rays I, 13 (I, 10 to 12); pectoral rays 15 (15 or 16); segmented caudal rays 15 (14 or 15); branched caudal rays 13 (9 and 13); scales in lateral series 39; transverse scale rows 13 (12 or 13); predorsal scales 20; postdorsal scales 11 or 12; gill rakers on first arch 3 + 9 = 12 (2 + 8 = 10); vertebrae 33.

Body elongate, laterally compressed, more strongly posteriorly; body depth at pelvic fin origin 23.2 per cent of SL; body depth at anal fin origin 21.2 per cent of SL. Head somewhat pointed with elongate, concave snout; nape strongly arched. Head length 35.5, snout length 9.5, eye width 7.1, interorbital width 7.4, all as percentage of SL. Mouth forming an angle of about 40 degrees with longitudinal axis of body; jaw extending to level about midway between front of eye and anterior edge of pupil; teeth of jaws numerous in dense bands, teeth of outer row enlarged; palate edentulous; tongue, palate, and floor of mouth with numerous small melanophores. Gill opening extends well forward of posterior

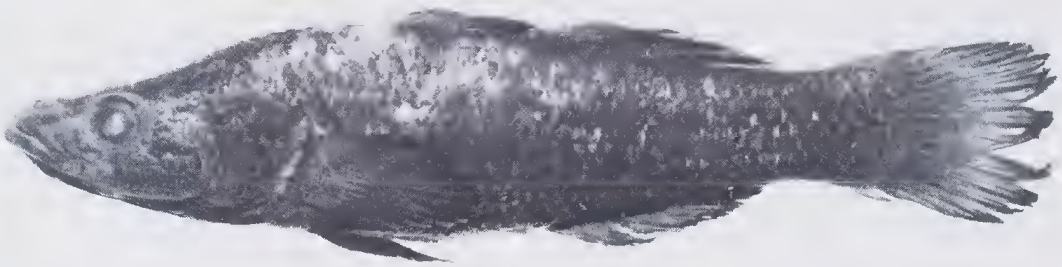

Figure 3 *Mogurnda furva,* holotype, 65.2 mm SL, Lake Kutubu.

Figure 4 Camera lucida drawing of head of *Mogurnda furva,* holotype, showing tracks of sensory papillae (stippled).

margin of preopercle. Head with numerous sensory papillae arranged in tracks as illustrated in Figure 4.

Scales of head, prcdorsal region, and bases of caudal and pectoral fins cycloid, remainder of body scales finely ctenoid (Figure 5). Head entirely scaled except lips, snout tip, preorbital region, lower jaw and chin; preopercle scales smaller than body scales and tend to be embedded.

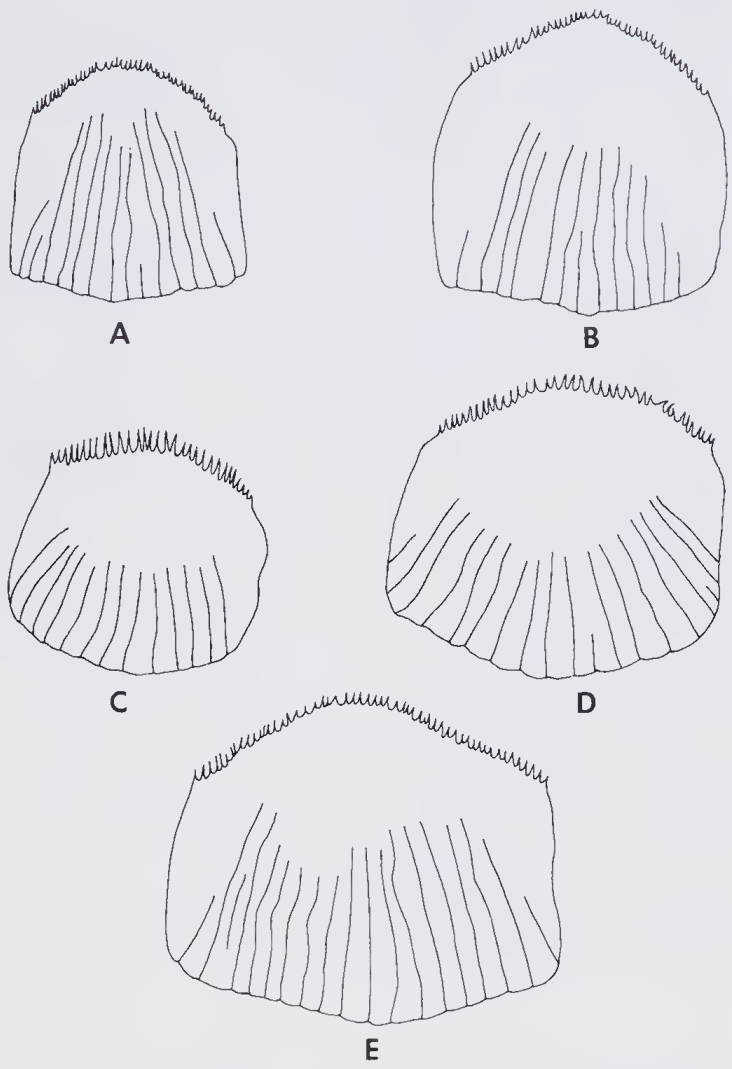

Figure 5 Camera lucida drawing of scales of *Mogurnda* from Lake Kutubu. All scales were taken from the same position (seventh scale of mid-lateral scale row) and are shown at the same magnification: (A) *M. furva,* 65.2 mm SL, (B) *M. kutubuensis,* 71.0 mm SL, (C) *M. variegata,* 68.0 mm SL, (D) *M. vitta,* 104.0 mm SL, and (E) *M. spilota,* 89.6 mm SL.

Second dorsal fin taller than first dorsal fin; fifth or sixth spine of first dorsal fin tallest; pectoral fins 21.5 per cent of SL; pelvic fins 19.9 per cent of SL; pectoral fins more or less rounded; pelvic fins pointed, the depressed tips nearly reaching anus. Caudal peduncle relatively elongate, its length 23.6 per cent of SL, and depth 12.6 per cent of SL; caudal fin rounded, its length 21.5 per cent of SL.

Colour when fresh: overall black, including fins except narrow white margin on dorsal and pelvic fins.

Colour in alcohol: overall dark brown, nearly black except anus and genital papilla white; fins blackish. Juvenile paratypes much lighter than holotype; whitish with dense covering of melanophores (except where scales are missing) giving overall dusky effect; fins blackish.

Remarks

A male specimen (CSIRO C2246, 114.1 mm SL) illustrated by Munro (1964: Figure 21-C) as *M. variegata* and examined by us, probably represents an adult of *M. furva*. We base this opinion on meristic characters and the following colour pattern features which it shares with *M. furva*, and which are lacking in other *Mogurnda* from Lake Kutubu: (1) although the specimen is overall light brown becoming darker dorsally, close inspection under magnification reveals a dense covering of pepper-like melanophores without any whitish or non-pigmented areas, even on the ventral surface; (2) absence of spoke-like bands radiating from rear or bottom edge of eye; (3) absence of banding or spotting on the dorsal and caudal fins. In addition, all median fins and the pelvics are dusky, although not as dark as in the types of *M. furva*. The following counts and measurements were recorded for this specimen: dorsal rays VIII-I, 11; anal rays I, 11; pectoral rays 15; segmented and branched caudal rays 15; scales in lateral series 39; transverse scale rows 13; predorsal scales 26; gill rakers on first arch 3 + 8 = 11. The following proportions are percentage of the standard length: body depth at pelvic fin origin 23.7; body depth at anal fin origin 23.5; head length 34.3; snout length 10.5; eye width 5.7; interorbital width 8.8, pectoral fin length 18.4; pelvic fin length 20.0; caudal peduncle length 21.7; caudal peduncle width 14.1; caudal fin length 19.5 (damaged).

The local inhabitants call this fish 'sabkisiwabo'. We name the species *furva* (Latin: dark, swarthy, or black) with reference to the characteristic coloration.

Mogurnda kutubuensis sp. nov.

Figures 6 and 7

Holotype

WAM P28159-011, female, 87.0 mm SL, Lake Kutubu, Papua New Guinea – Station 2.

Paratypes

AMS I25781-001, 12 specimens, 19.0-82.0 mm SL, collected with holotype; PNG unregistered, 9 specimens, 21.0-57.0 mm SL, collected with holotype; WAM P28158-008, 30 specimens, 21.4-67.8 mm SL, Lake Kutubu — Station 1; WAM P28159-008, 112 specimens, 16.0-77.0 mm SL, collected with holotype.

Diagnosis

A species of *Mogurnda* with a short, rounded snout, allied to *M. mogurnda* (Richardson) from Australia and several undescribed species from New Guinea. It differs from them in colour pattern (strongly mottled or overall dark instead of having series of large blotches midlaterally or vertical banding) and the following combination of characters: dorsal rays VII or VIII-I, 10 to 12; anal rays I, 11 to 13; scales in lateral series 36 to 38; transverse scale rows 13; predorsal scales 18 to 20; vertebrae 33; gill opening ends below posterior margin of preopercle; small scales present between supraorbital papillae and eye.

Description

Dorsal rays VIII-I, 11 (VII or VIII-I, 10 to 12); anal rays I, 11 (I, 11 to 13); pectoral rays 15 (15 or 16); segmented caudal rays 15; branched caudal rays 15 (14 or 15); scales in lateral series 38 (36 to 38); transverse scale rows 13; predorsal scales 20 (18 to 20); postdorsal scales 12 (11 or 12); gill rakers on first arch 2 + 10 = 12 (2 + 8 to 10 = 10 to 12); vertebrae 33.

Body elongate, laterally compressed, more strongly posteriorly; body depth at pelvic fin origin 28.2 per cent (27.0-29.9) of SL; body depth at anal fin origin 23.0 per cent (24.0-25.7) of SL. Head rounded with relatively short snout, its profile straight or slightly concave; nape strongly arched. Head length 35.6 (32.2-36.0), snout length 9.1 (7.8-9.8), eye width 8.2 (7.1-8.3), interorbital width 12.6 (9.7-12.6), all as percentage of SL. Mouth forming an angle of about 52 degrees with longitudinal axis of body; jaw extending to level of anterior edge of pupil; teeth of jaws numerous in dense bands, teeth of outer row enlarged; palate edentulous; tongue, palate, and floor of mouth pale with numerous melanophores. Gill opening extends to below posterior margin of preopercle. Head with numerous sensory papillae arranged in tracks as illustrated in Figure 7.

Scales of head, predorsal region, and bases of caudal and pectoral fins cycloid, remainder of body scales ctenoid (Figure 5). Head entirely scaled except lips, snout tip, preorbital region, lower jaw and chin; preopercle scales smaller than body scales and tend to be embedded.

Second dorsal fin significantly taller than first dorsal fin; sixth or seventh spine of first dorsal fin tallest; pectoral fins 22.2 per cent (21.4-23.1) of SL, shorter than pelvic fins 18.4 per cent (18.8-24.3) of SL; pectoral fins rounded, pelvic fins pointed, the depressed pelvic fin tips falling well short of genital papilla. Caudal peduncle relatively elongate, its length 23.8 per cent (21.9-25.6) of SL, and depth 12.6 per cent (13.4-14.6) of SL; caudal fin rounded, its length 24.5 per cent (22.8-25.0) of SL.

Figure 6 *Mogurnda kutubuensis,* holotype (upper), 87.0 mm SL, and paratype, 55.2 mm SL, Lake Kutubu.

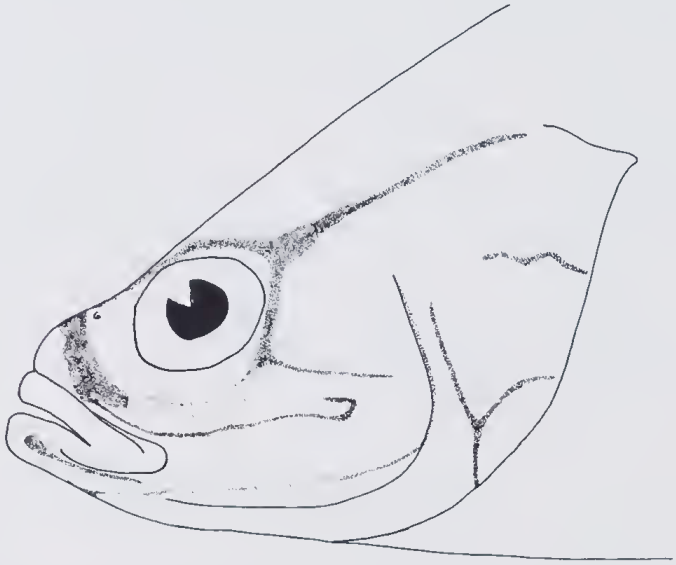

Figure 7 Camera lucida drawing of head of *Mogurnda kutubuensis,* 73.0 mm SL, showing tracks of sensory papillae (stippled).

Colour when fresh: dark reddish-brown on upper part of body and top of head; sides with large irregular red-brown blotches with intervening areas light blue-green; underside of head, breast, and belly region yellowish or tan; head with three relatively broad stripes radiating from eye, first from lower edge of eye to lower edge of opercle, second from lower posterior corner of eye to middle of opercular margin, third (sometimes obscure) from upper posterior corner of eye to upper opercular margin and continued on to upper half of pectoral fin base; areas between light blue-green; fins dusky red-brown, dorsal, caudal, and anal fins with small brown to reddish spots.

Colour in alcohol: large specimens (in excess of about 75 mm SL) mainly dark brown with faint indication of dark spotting on side as described above; head with three dark brown stripes radiating from eye to edge of operculum as described above; fins dark brown to blackish with faint spots on dorsal and caudal fins. Juveniles under about 40 mm SL, have a series of approximately 10 to 12 brown eye-sized blotches along the middle of the sides on a tan ground colour, grading to dark brown dorsally. Intermediate specimens (40-75 mm SL) have the sides covered with numerous interconnected, irregular, brown blotches on a tan ground. The two dorsal fins, caudal and anal fins are frequently covered with numerous small dark brown spots. These individuals also show a pair of short stripes from the front edge of the eye to the upper lip.

Remarks

M. kutubuensis belongs to a group of closely related species which we refer to as the *Mogurnda mogurnda* complex, based on their similarity to this widespread Australian species. The group contains several new taxa from New Guinea which will be treated in a forthcoming review of *Mogurnda* by the present authors. The species are distinguished mainly by fin ray and scale counts in combination with colour pattern features. *Mogurnda kutubuensis* has a colour pattern unlike that of any other member of the complex, consisting of numerous, interconnected, irregular-shaped blotches, rather than having a series of relatively few large blotches along the side or alternating light and dark bars. It further differs from an undescribed species from the Fly and Digul rivers in having fewer lateral scale rows ((36-38 v. 45-52) and fewer soft dorsal and anal rays (usually 11 or 12 v. 14 or 15). Another undescribed species from the Port Moresby area has a slightly lower lateral scale row count (34-36) and has a series of squarish blotches or bars along the side.

M. kutubuensis and *Oxyeleotris fimbriata* were the most abundant eleotrids in our collections from Lake Kutubu. Both species were common along the vegetated shallow margin of the lake and immediate tributaries.

There are no obvious sex differences related to fin shape or colour pattern in *M. kutubuensis,* although sex is easily determined by examining the genital papilla (Figure 2). This feature is useful for specimens as small as 38-40 mm SL.

Munro (1964: Figure 21-E) illustrated a large (102 mm SL) male with an overall dark brown colour as a variety of *Mogurnda variegata*. Examination of this fish (CSIRO C2251) reveals it is *M. kutubuensis*. It has the characteristic short, rounded snout (see Figure 7) and in this respect Munro's illustration is inaccurate. The dark coloration is typical of several large adults in the type series.

We name the species *kutubuensis* with reference to the type locality. The local name for this fish is 'anaku'.

Mogurnda spilota sp. nov.

Figures 8 and 9

Holotype

WAM P28159-010, male, 89.6 mm SL, Lake Kutubu, Papua New Guinea – Station 2.

Paratypes

CSIRO C2249, female, 92.8 mm SL; CSIRO C3175, female, 125.5 mm SL; CSIRO C3176, female, 125.5 mm SL, CSIRO C3189, male, 91.0 mm SL; CSIRO C3190, female, 91.4 mm SL; WAM P28158-010, female, 55.5 mm SL; Lake Kutubu, Papua New Guinea – Station 1.

Diagnosis

A species of *Mogurnda* differing from most members of the genus by an elongate, pointed snout and colour pattern consisting of large white blotches on a greenish-brown ground and with white spoke-like bands radiating from rear portion of eye. It is most closely allied to *M. furva, M. variegata,* and *M. vitta,* all of Lake Kutubu, which have a similar snout shape, but differs from them in colour. It further differs from *M. vitta* in being deeper bodied (depth at pelvic origin 21.4-27.0 per cent [average 24.5] of SL v. 19.3-21.3 per cent [average 20.3]) in having 15 rather than 14 pectoral rays, 37-40 scales in mid-lateral series compared with 42-43, and having a concave rather than straight snout profile. It also differs from *M. variegata* in having a lower transverse scale row count (12-13 v. 14-15).

Description

Dorsal rays VIII-I, 11 (VII or VIII-10 to 12); anal rays I, 12 (12-13); pectoral rays 15; segmented caudal rays 15; branched caudal rays 14 (14 or 15); scales in lateral series 37 (37-40); transverse scale rows 13 (12 or 13); predorsal scales 18 (20-23); postdorsal scales 12 (11 or 12); gill rakers on first arch 2 + 9 = 11 (2 or 3 + 8 or 9 = 11); vertebrae 33.

Body elongate, laterally compressed, more strongly posteriorly; body depth at pelvic fin origin 25.9 per cent (21.4-27.0) of SL; body depth at anal fin origin 22.3 per cent (20.2-23.0) of SL. Head somewhat pointed with elongate, concave snout; nape strongly arched. Head length 36.3 (35.7-37.0), snout length 10.6 (9.6-11.3), eye width 7.4 (5.7-6.8), interorbital width 10.2 (8.7-11.1), all as

percentage of SL. Mouth forming an angle of about 38 degrees with longitudinal axis of body; jaw extending to level of anterior edge of pupil; teeth of jaws numerous in dense bands, teeth of outer row enlarged; palate edentulous; tongue, palate, and floor of mouth with numerous melanophores. Gill opening extends well forward of posterior margin of preopercle. Head with numerous sensory papillae arranged in tracks as illustrated in Figure 9.

Scales of head, predorsal region, and bases of caudal and pectoral fins cycloid, remainder of body scales ctenoid (Figure 5). Head entirely scaled except lips, snout tip, preorbital region, lower jaw and chin; preopercle scales smaller than body scales and tend to be embedded.

Second dorsal fin significantly taller than first dorsal fin; sixth spine of first dorsal fin tallest; pectoral fins 20.6 per cent (18.7-23.0) of SL; pelvic fins 23.4 per cent (15.0-22.0, most damaged) of SL; pectoral fins rounded; pelvic fins pointed, the depressed pelvic fin tips reaching beyond base of genital papilla.

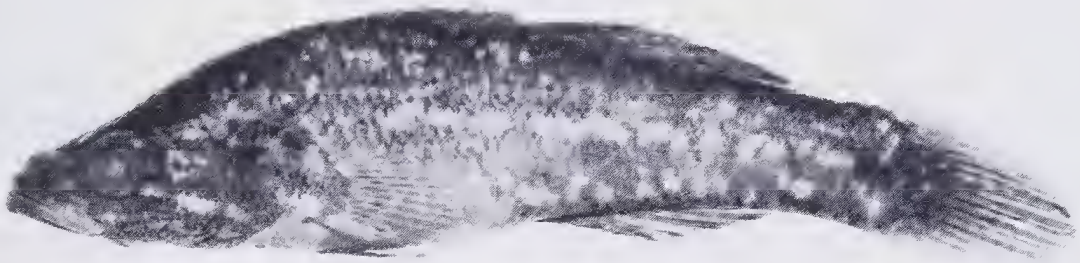

Figure 8 *Mogurnda spilota*, holotype, 89.6 mm SL, Lake Kutubu.

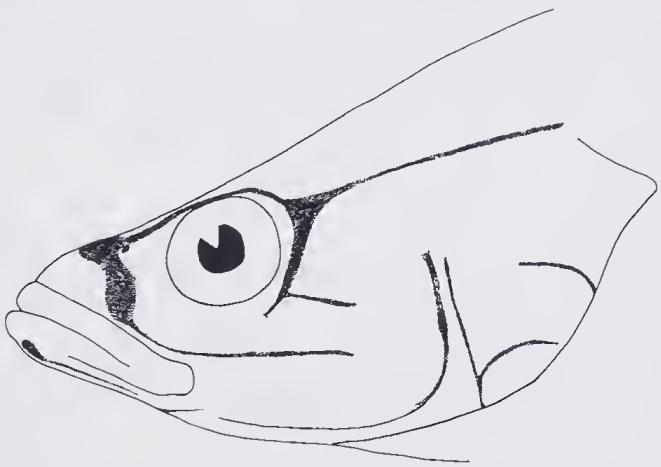

Figure 9 Camera lucida drawing of head of *Mogurnda spilota*, holotype, showing tracks of sensory papillae (stippled).

Caudal peduncle relatively elongate, its length 22.3 per cent (23.1-26.1) of SL, and depth 13.4 per cent (11.8-13.1) of SL; caudal fin rounded, its length 25.4 per cent (18.7-25.2, most damaged) of SL.

Colour when fresh: overall dark greenish-brown grading to whitish on underside of head, breast, and belly; lower side of head and pectoral region golden brown; lips and chin dusky brown; series of about 10 irregular-shaped white blotches (about eye size) along middle of side from upper corner of operculum to base of caudal fin; second series of similar, although less well defined blotches from lower pectoral fin base to lower caudal base; 2-3 similar, but fainter blotches on side of nape; upper surface of head and nape with dense whitish mottling; head with three broken white stripes, first from below eye to lower preopercular margin, second from lower posterior corner of eye to lower opercular margin, third across middle of operculum and continued on base of pectoral fin; dorsal fins and anal fin whitish with several dark brown stripes; caudal fin dark brown on basal half with irregular white bars, faintly spotted with brown distally; pelvic fins slightly dusky brown; pectoral fins translucent with brown rays and light brown spotting.

Colour in alcohol: similar to above coloration except golden-brown not apparent on lower sides. After 30 years in preservative the CSIRO paratypes are overall light brown with some darker brown mottling, grading to dusky whitish or tan ventrally, with faint indications of white blotches described above. The dorsal, caudal, anal, and pectoral fins on most of these individuals are spotted.

Remarks

This species was illustrated by Munro (1964: Figure 21-B). He gave the native name of 'feferigugisabo'. There does not appear to be any sexual dimorphism other than the difference in genital papilla structure (Figure 2).

We name this species *spilota* Greek: stained or spotted with reference to the colour pattern.

Mogurnda variegata Nichols

Figures 10 and 11

Mogurnda variegata Nichols, 1951: 1, Figure 1 (Lake Katuba [Kutubu], Papua New Guinea).

Diagnosis

A species of *Mogurnda* differing from most members of the genus by an elongate, pointed snout, and colour pattern consisting of a maze of large dark brown blotches on a tan or yellowish ground, with dark brown spoke-like bands radiating from lower and posterior edge of eye. It is most closely allied to *M. furva, M. spilota,* and *M. vitta,* all of Lake Kutubu, which have a similar snout shape, but differs from them in colour. It further differs from these species in having 14 or

15 transverse scale rows, and from *M. vitta* in being deeper bodied (depth at pelvic origin 22.0-26.2 per cent [average 24.4] of SL v. 19.3-21.3 per cent [average 20.3]), having 15 rather than 14 pectoral rays, 36-40 scales in mid-lateral series compared with 42-43, and having a concave rather than straight snout profile.

Description

Dorsal rays VII or VIII-I, 10 to 12; anal rays I, 11 to 13; pectoral rays 15; segmented caudal rays 15; branched caudal rays 13 to 15; scales in lateral series 36 to 40; transverse scale rows 14 or 15; predorsal scales 19 to 24; postdorsal scales 11 or 12; gill rakers on first arch 2 to 4 + 8 or 9 = 10 to 13; vertebrae 33 (rarely 32).

Body elongate, laterally compressed, more strongly posteriorly; body depth at pelvic fin origin 22.0-26.2 per cent of SL; body depth at anal fin origin 20.2-24.4 per cent of SL. Head somewhat pointed with elongate, concave snout; nape strongly arched. Head length 35.2-41.4, snout length 9.1-11.1, eye width 5.2-7.9, interorbital width 7.7-9.6, all as percentage of SL. Mouth forming an angle of about 40 degrees with longitudinal axis of body; jaw extending to level about midway between front of eye and anterior edge of pupil; teeth of jaws numerous in dense bands, teeth of outer row enlarged; palate edentulous; tongue, palate, and floor of mouth pale with few melanophores. Gill opening extends well forward of posterior margin of preopercle. Head with numerous sensory papillae arranged in tracks as illustrated in Figure 11.

Scales of head, predorsal region, and bases of caudal and pectoral fins cycloid, remainder of body scales ctenoid (Figure 5). Head entirely scaled except lips, snout tip, preorbital region, lower jaw and chin; preopercle scales smaller than body scales and tend to be embedded.

Second dorsal fin significantly taller than first dorsal fin; fifth or sixth spine of first dorsal fin tallest; pectoral fins 17.5-25.4 per cent of SL (some damaged); pelvic fins 18.0-24.0 per cent of SL; (some damaged); pectoral and pelvic fins pointed, the depressed pelvic fin tips reaching beyond base of genital papilla. Caudal peduncle relatively elongate, its length 21.5-26.2 per cent of SL, and depth 12.1-13.9 per cent of SL; caudal fin rounded, its length 23.2-25.4 per cent of SL.

Colour when fresh: overall pale yellowish-tan with large mottled, dark brown spots covering upper two-thirds of body; head with two dark brown bands radiating from back of eye, across preopercle; upper surface of head and nape strongly mottled; both dorsal fins and caudal fin pale yellow with dark brown spots; remaining fins pale yellow, but anal fin with narrow brown stripe at base and dark brown or blackish margin, more pronounced posteriorly.

Colour in alcohol: overall tan with brown mottling on body and spots on fins as described above. After 30 years in preservative the CSIRO paratypes are generally lighter and more yellowish ventrally. The dark mottling on most of the specimens is not as well defined as on the fresher material, but the characteristic

maze-like mottling on the top of the head is clearly evident particularly on the larger (110-126 mm SL) specimens.

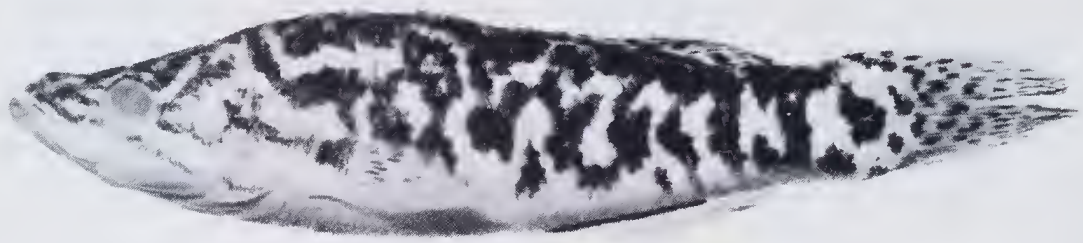

Figure 10 *Mogurnda variegata,* 70.5 mm SL, Lake Kutubu.

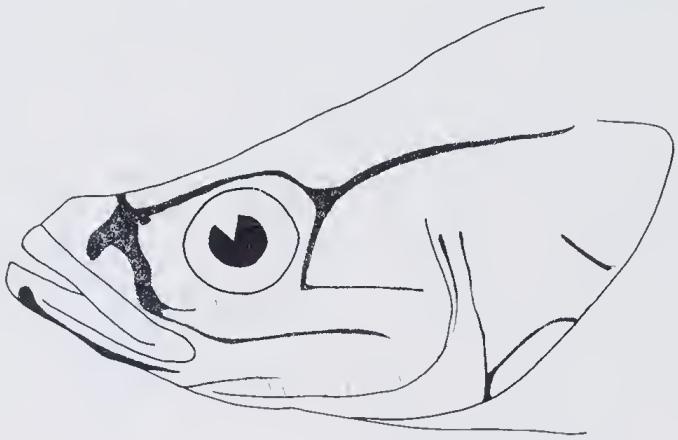

Figure 11 Camera lucida drawing of head of *Mogurnda variegata,* 70.5 mm SL, showing tracks of sensory papillae (stippled).

Remarks

This species was illustrated by Munro (1964, Figure 21-A), although our 1983 material lacks the spots which were shown on the anal fin. According to Munro the native name for the spotted anal variety is 'ikiguabi' and the pale finned variety is known as 'seragate', the latter name was also used by the hired canoeists for the specimens we collected.

Except for the structure of the genital papilla (Figure 2) there is a lack of pronounced sexual dimorphism. The CSIRO and WAM material consists of six males, 67.0-125.8 mm SL, and eight females, 50.5-110.0 mm SL.

Material examined

AMNH 18576, holotype, 75.0 mm SL, Lake Kutubu; AMNH 15101, paratypes, 10 specimens, 45.0-81.0 mm SL, Lake Kutubu; CSIRO A2134-35, 2 specimens, 72.4-76.1 mm SL;

CSIRO C2248, 125.8 mm SL, CSIRO C2250, 110.0, mm SL; CSIRO C3184-85, 2 specimens, 93.2-110.0 mm SL; WAM P28158-007, 7 specimens, 50.5-73.6 mm SL, Lake Kutubu, Papua New Guinea — Station 1; WAM P28159-007, 55 mm SL, Lake Kutubu — Station 2.

Mogurnda vitta sp. nov.

Figures 12 and 13

Holotype

WAM P28159-012, male, 104.0 mm SL, Lake Kutubu, Papua New Guinea — Station 2.

Paratypes

CSIRO IA8086, female, 120.7 mm SL; CSIRO C2247, female, 88.2 mm SL; CSIRO C3188, male, 95.5 mm SL; WAM P28159-013, 55.0 mm SL, collected with holotype.

Diagnosis

A species of *Mogurnda* differing from most members of the genus by an elongate, more or less rounded snout (Figure 13), and pattern consisting of a brownish colour on the upper two-thirds of the body and a broad white mid-lateral stripe (series of white blotches in young specimens), with brown spoke-like bands radiating from lower and posterior edge of eye. It is most closely allied to *M. furva, M. spilota,* and *M. variegata,* all of Lake Kutubu, which have a similar, although more pointed, snout shape, but differs from them in colour. It is further distinguished from these species in having a more slender body (depth at pelvic origin 19.3-21.3 per cent [average 20.3] of SL v. 21.4-27.0 per cent [average 23.0-24.5], having 14 rather than 15 pectoral rays, 42-43 scales in mid-lateral series compared with 36-40, and having a straight rather than concave snout profile.

Description

Dorsal rays VIII (VII)-1, 11; anal rays 1, 11 (10-13); pectoral rays 14; segmented caudal rays 15 (14 to 16); branched caudal rays 15 (13 to 15); scales in lateral series 43 (42); transverse scale rows 13 (12 to 13); predorsal scales 23 (21 to 27); postdorsal scales 13 (12 to 14); gill rakers on first arch 2 + 9 = 11; vertebrate 33 (33 or 34).

Body elongate, laterally compressed, more strongly posteriorly; body depth at pelvic fin origin 20.0 per cent (19.3-21.3) of SL; body depth at anal fin origin 18.4 per cent (18.3-20.0) of SL. Head rounded with elongate snout, its profile straight; nape gently arched. Head length 33.1 (31.5-36.4), snout length 9.2 (8.5-11.3), eye width 5.9 (5.7-7.6), interorbital width 8.9 (7.6-10.0), all as percentage of SL. Mouth forming an angle of about 32 degrees with longitudinal axis of body; jaw extending to level of anterior edge of pupil; teeth of jaws numerous in dense bands, teeth of outer row enlarged; palate edentulous; tongue,

palate, and floor of mouth pale with few melanophores. Gill opening extends well forward of posterior margin of preopercle. Head with numerous sensory papillae arranged in tracks as illustrated in Figure 13.

Figure 12 *Mogurnda vitta,* holotype, 104.0 mm SL, Lake Kutubu.

Figure 13 Camera lucida drawing of head of *Mogurnda vitta,* holotype, showing tracks of sensory papillae (stippled).

Scales of head, predorsal region, and bases of caudal and pectoral fins cycloid, remainder of body scales ctenoid (Figure 5). Head entirely scaled except lips, snout tip, preorbital region, lower jaw and chin; preopercle scales smaller than body scales and tend to be embedded.

Second dorsal fin significantly taller than first dorsal fin; sixth spine of first dorsal fin tallest; pectoral fins 19.2 per cent (17.8-21.3) of SL, pelvic fins 18.5 per cent (16.8-24.9, all but smallest damaged) of SL; pectoral fins rounded; pelvic fins pointed, the depressed pelvic fin tips reaching beyond base of genital papilla in smallest paratype, but considerably shorter in holotype and other paratypes. Caudal peduncle relatively elongate, its length 21.8 per cent (21.8-24.6) of SL, and depth 11.0 per cent (10.4-11.8) of SL; caudal fin rounded, its length 21.6 per cent (18.5-24.9, damaged in most) of SL.

Colour when fresh: greenish-brown on back and dorsal half of head; broad white stripe from upper edge of operculum to base of caudal fin, bordered above and below with dark brown stripes, nearly equal in width to white stripe and joining at caudal base; lower portion of head and body pale yellow to whitish, two stripes radiating from eye, one from bottom part of eye to middle section of cheek, the other from lower posterior corner of eye to upper margin of preoperculum; anterior portion of lips dusky brown; intense dark brown spot (nearly equal to pupil) above upper edge of preopercle; dorsal fins translucent with faint brown spotting; caudal fin slightly dusky brown with scattered brown spots basally; anal fin yellow-white with black submarginal band and narrow white margin; pelvic fins whitish; pectoral fins translucent with yellow hue and brown pigment covering upper half of base. Juvenile paratype (male, 55.0 mm SL) similar overall except white mid-lateral stripe replaced by series of nine white blotches and caudal fin more heavily spotted.

Colour in alcohol: similar to fresh coloration, basically dark brown dorsally with whitish mid-lateral stripe and ventral region. After 30 years in preservative the CSIRO specimens still retain the characteristic striped pattern, but are generally lighter with the mid-lateral stripe and ventral part of the head and body yellowish or tan.

Remarks

This species was illustrated by Munro (1964: Figure 21-D). He gave the native name of 'kaigibu'. We name this species *vitta* (Latin: ribbon, band, or stripe) with reference to the distinctive colour pattern.

Oxyeleotris fimbriata (Weber)

Figures 14 and 15

Eleotris fimbriata Weber, 1908: 254 (Etna Bay, southern New Guinea).

Diagnosis

A species of *Oxyeleotris* differing from other members of the genus by a combination of features which include: soft rays in second dorsal fin 10 or 11; soft anal rays 8 to 10; scales in lateral series 55 to 65; predorsal scales 28 to 40; colour generally dark brown, often with series of darker chevron-shaped markings along side and large blackish spot at base of upper caudal fin rays.

Description

Dorsal rays VI-I, 10 or 11; anal rays I, 8 to 10; pectoral rays 15; segmented caudal rays 16 to 18; branched caudal rays 15 or 16; scales in lateral series 55 to 60; transverse scale rows 18 to 21; predorsal scales 34 to 40; postdorsal scales 15 to 18; gill rakers on first arch 2 + 9 or 10 = 11 or 12; vertebrae 28 (rarely 29).

Body elongate, laterally compressed in posterior portion more or less cylindrical anteriorly; body depth at pelvic fin origin 21.8-24.9 per cent of SL; body depth at anal fin 17.1-20.4 per cent of SL. Head blunt and depressed with elongate, rounded snout; napc gently arched. Head length 37.6-40.4, snout length 9.1-10.6, eye width 5.2-6.3, interorbital 9.1-10.9, all as percentage of SL. Mouth forming an angle of about 30-35 degrees with longitudinal axis of body; jaw extending to level of posterior part of cye; lips fimbriate, teeth of jaws numerous in dense bands, teeth of outer row enlarged; palate edentulous. Gill opening extends well forward of posterior margin of preopercle. Head with numerous sensory papillae arrangcd in tracks as illustrated in Figure 15.

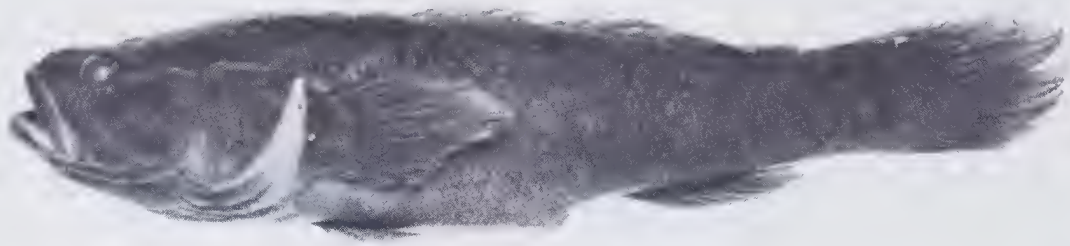

Figure 14 *Oxyeleotris fimbriata,* 125.0 mm SL, Lake Kutubu.

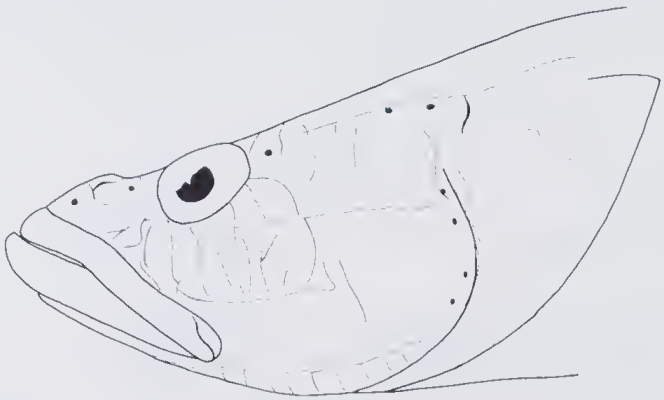

Figure 15 Camera lucida drawing of head of *Oxyeleotris fimbriata,* 105.0 mm SL, showing tracks of sensory papillae (stippled).

Scales of head, prcdorsal region, anterior part of body, and bases of caudal and pcctoral fin cycloid, remaindcr of body scales ctenoid. Head entircly scaled exccpt lips, snout, preorbital rcgion, lower jaw and chin; predorsal scales cx-tending to mid-interorbital; preopercle scales smallcr than body scales and tend to be cmbedded.

Second dorsal fin significantly taller than first dorsal fin; third or fourth spine of first dorsal fin tallest; pectoral fins 19.7-22.7 per cent of SL; pelvic fins 17.7-19.0 per cent of SL; pectoral fins rounded; pelvic fins short and pointed, the depressed pelvic fin tips falling well short of base of genital papilla. Caudal peduncle relatively elongate, its length 20.1-21.7 per cent of SL, and depth 12.0-14.0 per cent of SL; caudal fin rounded, its length 22.5-23.8 per cent of SL.

Colour when fresh: overall dark brown, lighter brown on underside of head and on breast and belly region; series of about 15 faint, narrow dark chevron markings, with their apex directed anteriorly, on side of body; head with three broad dark brown stripes with lighter brown spaces between them, first from maxillary to lower edge of preopercle, second from bottom of eye to lower edge of preopercle, third from lower posterior corner of eye to angle of preopercle; fins dark brown with narrow whitish borders, except bottom half of pectoral lighter brown.

Colour in alcohol: adults similar to above description, but sometimes lacking chevron markings, some with small, dark brown spots dorsally on head and body. Juveniles (under about 70 mm SL) are generally lighter brown and have more vivid chevron markings on the side, and an intense black spot on the upper caudal fin base. Also the dorsal and caudal fins are prominently spotted. The juvenile markings gradually fade into the more sombre adult coloration with increased growth, although the chevron markings along the side are often faintly evident in adults.

Remarks

There is an urgent need for revision of the New Guinea species of *Oxyeleotris*. The species previously recognised as *O. fimbriata* is probably divisible into at least three species. Another member of this complex, *O. wisselensis* Allen and Boeseman, 1982 inhabits the Wissel or Paniai Lakes of Irian Jaya (western New Guinea). We provisionally identify the Lake Kutubu specimens as the nominal *O. fimbriata* as the counts for lateral scale rows and predorsal scales (55-60 and 34-40 respectively) agree with specimens from a broad area of southern New Guinea including the type locality near Etna Bay, Irian Jaya. The species has been reported from both southern and northern New Guinea by Koumans (1953). However, specimens from the Sepik Basin of northern New Guinea appear to be distinct with regard to lateral scale row counts (71-85). Another population from the Vogelkop Peninsula of far western New Guinea has a similar scale count, but differs from the Sepik population in shape and colour pattern.

The Lake Kutubu people refer to this species as 'nafa'. It was previously reported from this locality by Munro (1964).

Material examined

WAM P28158-006, 11 specimens, 58.0-140.0 mm SL, Lake Kutubu – Station 1; WAM P28159-006, 31 specimens, 18.0-157.0 mm SL, Lake Kutubu – Station 2.

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